Final Report

for the

Swift River Stabilization Project at the Conway Scenic Railroad Crossing

Conway, New Hampshire

A Final Report to

The New Hampshire Department of Environmental Services

Submitted by

Headwaters Hydrology, PLLC
254 Mann's Hill Road
Littleton, NH 03561
(603) 444-2544
Contact: Sean P. Sweeney, P.E., CWS

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Executive Summary

This phase of Swift River Stabilization Project involved final design of improvements to the railroad crossing and river aimed at stabilizing the channel, protecting the railroad, improving aquatic and riparian habitats, and reducing the sediment pollutant load. Construction plans were prepared along with environmental permit applications, an estimate of construction costs, and a pollutant load reduction estimate. This phase builds upon a previous assessment of the Swift River at the project site completed in 2004 and is intended to ultimately support project implementation.

The total project cost was $80,000. Sixty percent of the cost was funded by a $48,000 NHDES Watershed Assistance Grant awarded to the Swift River Local Advisory Committee (SRLAC). The NH Governor and Executive Council authorized NHDES to enter into a grant agreement with the SRLAC at their June 13, 2007 meeting. The remaining forty percent of the project cost ($32,000) was funded by cash contributions from the Conway Scenic Railroad, Inc., who provided $29,000, and the SRLAC, who provided $3,000. The project completion date is December 31, 2009.

Upon submittal and NHDES approval of this final report all performance targets required under the grant agreement will have been met.

Introduction

A stable river channel is one which, over time, in the present climate, transports the water and sediment produced by its watershed in such a manner that the stream maintains its dimension, pattern, and profile without aggrading or degrading (Rosgen, 1996). Applying these stability criteria leads to the conclusion that the Swift River is unstable in the vicinity of the Conway Scenic Railroad crossing.

The underlying cause of this instability is the constriction created by the railroad bridge and embankments. The span of the bridge is about the same as the river channel; however, the embankments completely obstruct the floodplain such that floodwaters which would normally flow over the floodplains are forced through the bridge opening. This constriction creates backwater during flood discharges which reduces the channel's energy and ability to transport its sediment load. As a result, sediment flowing in from upstream sources is deposited, causing the river to aggrade. This aggradation has caused the river to widen considerably, eroding land and introducing additional sediment

to the channel in the process. Aggradation has also resulted in several meander avulsions in the project vicinity, filling of pools, and significant loss of aquatic habitat.

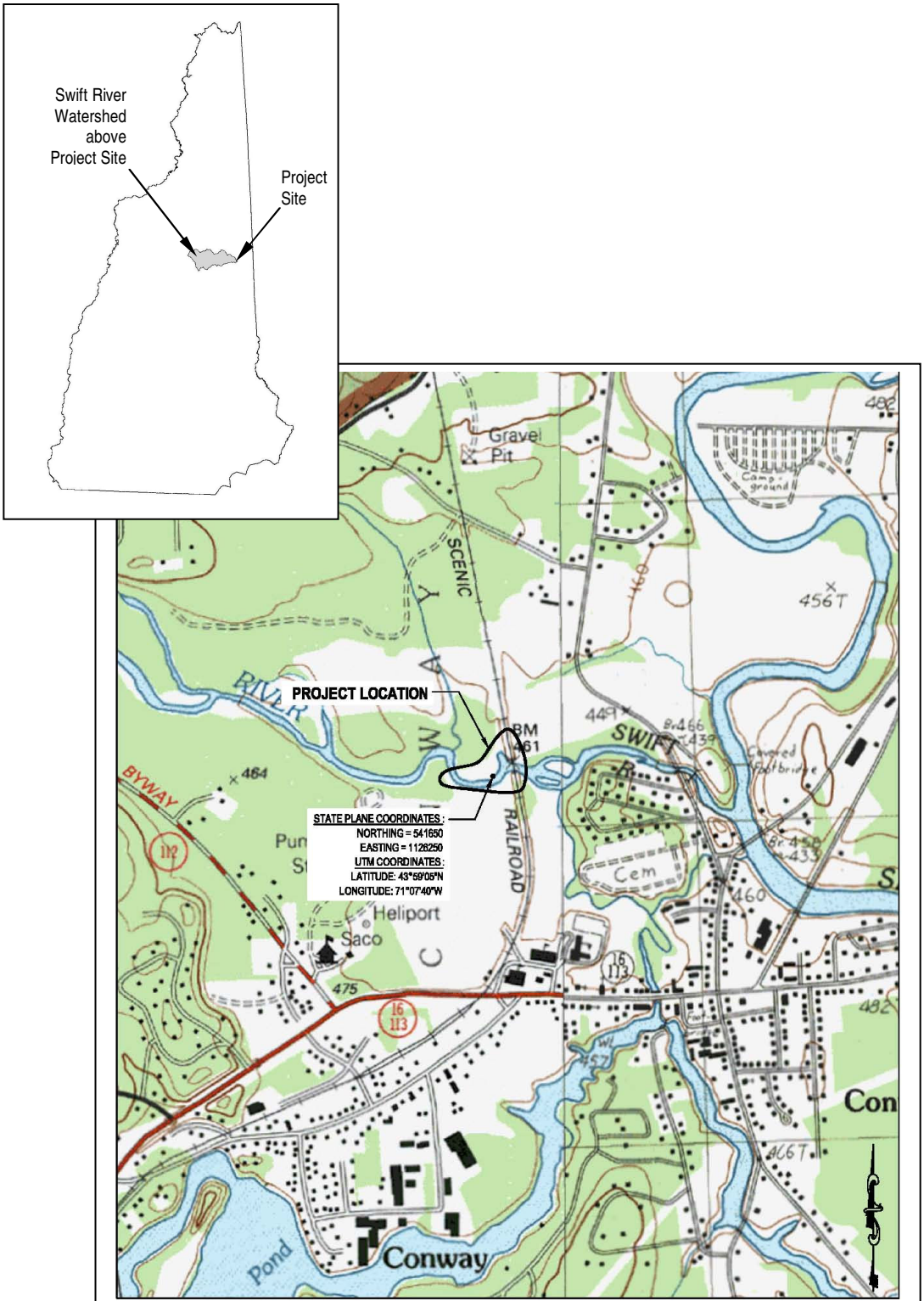

FIGURE 1
Location Map

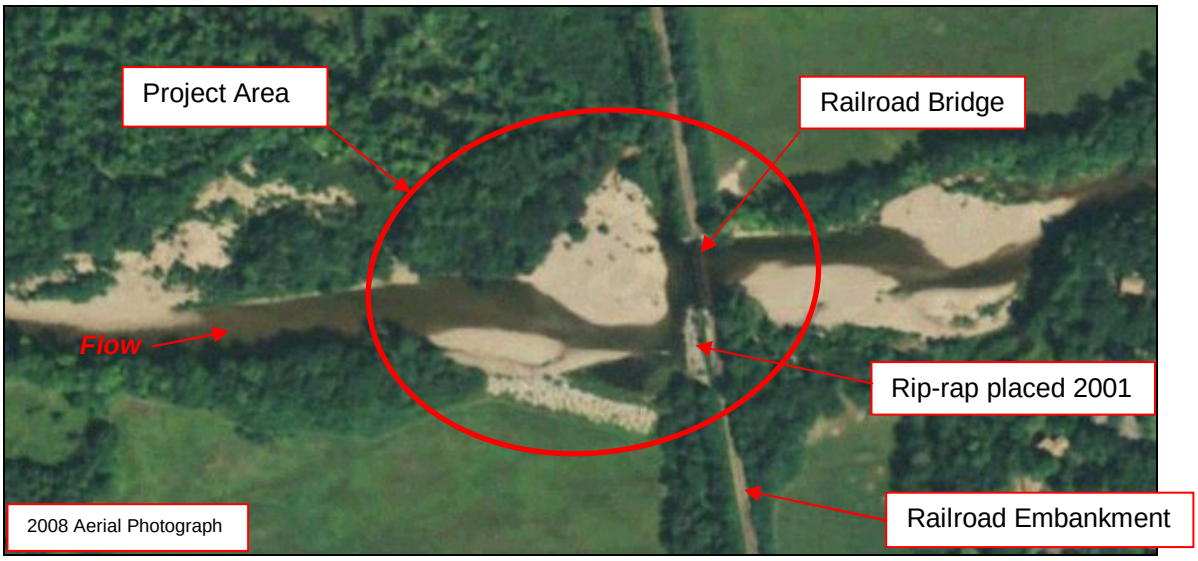

FIGURE 2
Project Site Map

Channel instability resulted in erosion of the railroad embankment which threatened the stability of the embankment and bridge. In February 2001 the Conway Scenic Railroad received a permit from the New Hampshire Department of Environmental Services (NHDES) Wetlands Bureau to place rock rip-rap on the eroding embankment on the upstream side of the crossing south of the bridge (see Figure 2). The rip-rap was placed in the summer of 2001. The Wetlands Bureau recognized that placement of the rip-rap addressed a symptom of the channel instability (erosion), but did little to address the underlying cause. Accordingly, the permit included a condition that "*Additional requests to dredge and/or fill in this area of the Swift River shall not be considered or approved until a complete analysis and assessment has been conducted by the applicant to determine a more effective, long-term solution which alleviates the deposition and erosion problem and has a lesser degree of environmental impact.*"

In response to the rip-rap project and permit condition, the SRLAC applied for, and received, a Watershed Restoration Grant from the NHDES Watershed Assistance Section in 2002 to fund a study of this reach of the Swift River. This study[1] was completed in 2004 and concluded that the river's inability to transport its sediment load has led to the instability and that the sediment transport impairment is due in large part to the floodplain obstruction created by the railroad embankments. To restore channel stability, the 2004 study recommended alleviating the constriction, restoring appropriate channel width and depth, and realigning the river. The current phase of the project has been aimed at developing plans and applying for the permits needed to implement the recommendations of the original study.

The overall project goal is to improve channel stability as this will reduce the risk of damage to the railroad, improve aquatic and riparian habitats, and reduce the sediment pollutant load. The river stabilization plans developed under this phase of the project include three primary components as follows.

[1] Provan & Lorber, Inc. *Assessment and Concept Plan Swift River at Conway Scenic Railroad Bridge Conway, New Hampshire.* April 2004.

1. Two large pre-cast concrete open-bottom arch culverts are proposed to be installed through the railroad embankments to alleviate the constriction and improve sediment transport continuity. These culverts would be installed with their inverts at the floodplain elevation so that they would only carry water during overbank flood events.

2. The channel immediately upstream from the bridge, which is currently very wide and shallow, is proposed to be narrowed to increase its mean depth and promote sediment transport competence.

3. Approximately 650 feet of the river immediately upstream from the bridge are proposed to be realigned in a manner which will reduce scouring forces on the railroad embankment, bridge abutment, and riverbanks. The proposed channel alignment would be would be more perpendicular to the bridge opening than the current alignment which resembles a sharp "S" with flows directed squarely into both the south railroad embankment and north bridge abutment.

The plans also call for aggressive revegetation of the riverbanks and floodplain bordering the realigned channel for long-term bank stability, water quality protection, and habitat enhancement. Three rock grade-control/flow deflection structures are proposed to prevent excessive riverbed scour, deflect high-velocity flows away from the riverbanks, and maintain the position of the realigned channel. A set of the proposed plans is included in Appendix 1. The estimated construction cost is $2.93 million. A copy of the construction cost estimate is included in Appendix 1.

Watershed Map

The project site is located approximately one-half mile upstream from the Swift River's confluence with the Saco River. The drainage area of the Swift River at the project site is approximately 87.2 square miles. The project is located in the Saco River watershed, HUC 01060002. Figure 3 identifies the watershed area which drains to the project site.

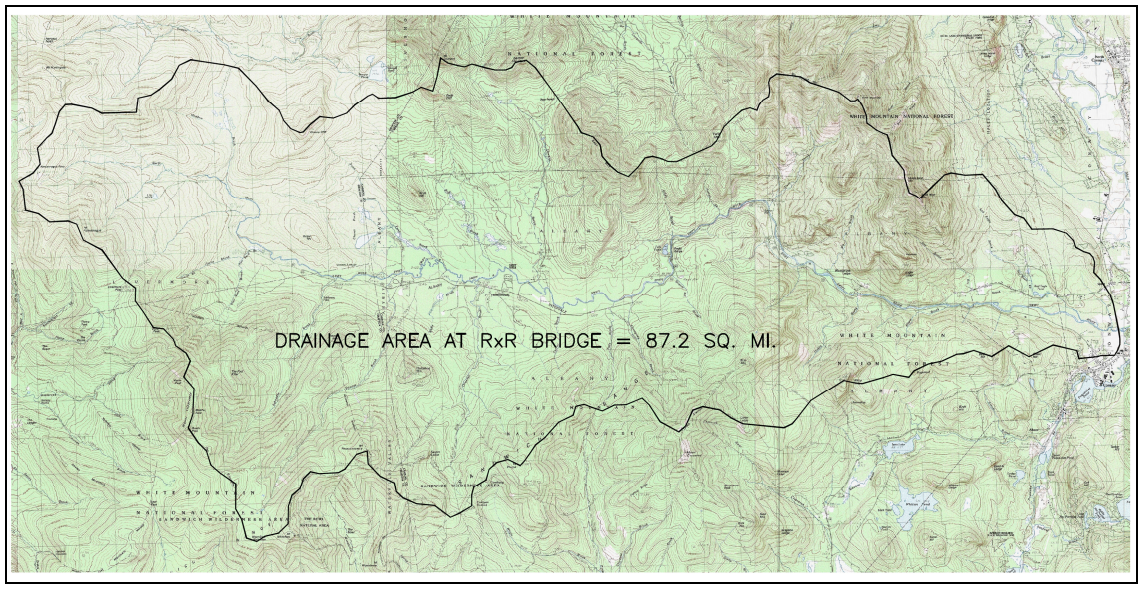

FIGURE 3
Watershed Map

Project Performance Targets and Milestones

The grant agreement between NHDES and SRLAC described the project performance targets and milestones as follows.

Performance Target 1: Geotechnical Investigations
Completion of drilling program, lab analysis, and geotechnical report to be used in support of the structural engineering design.

Task 1A: Conduct site reconnaissance to observe surficial features and stake proposed boring locations for Dig Safe utility clearance. Deliverable: Boring logs.

Task 1B: Conduct subsurface explorations (drilling). Deliverable: Boring logs.

Task 1C: Conduct mechanical grain size analyses on soil samples obtained from the borings. Use results to assist with soil classification, design foundation drain filters, and for scour analyses. Deliverable: Lab analysis results.

Task 1D: Evaluate results of the drilling program and laboratory testing to develop recommendations for geotechnical aspects of the project. Deliverable: Geotechnical report.

Performance Target 2: Field Surveys, Wetland Delineation, & Additional Data Collection
Completion of a topographic survey, re-survey of cross-sections established and originally surveyed in 2003, delineation of jurisdictional waters in the project area, collection of additional data for use in sediment transport calculations, and preparation of a topographic base plan of the project area including the wetland boundaries.

Task 2A: Complete topographic and cross-section surveys. Deliverable: Topographic base plan and cross-section plots.

Task 2B: Complete wetland delineation. Deliverable: Topographic base plan showing wetland boundaries and stamped by a Certified Wetland Scientist.

Task 2C: Complete geomorphic Data Collection. Deliverable: Bar sample data and particle size distribution plots

Performance Target 3: Hydraulic Modeling
Completion of existing and proposed conditions hydraulic models using the U.S. Army Corps of Engineers HEC-RAS computer modeling program to evaluate the effects of the proposed floodplain culverts.

Task 3: Complete hydraulic modeling. Deliverable: Results of the existing and proposed conditions hydraulic models

Performance Target 4: Preliminary Design Plans
Preparation of preliminary plans illustrating the proposed flood plain culverts and river channel modifications.

Task 4: Develop preliminary plans which illustrate proposed channel modifications and the preferred configuration of flood plain culverts. Deliverable: copies of the preliminary design plans.

Performance Target 5: Abutter Notification and Support
Prepare updated list of project abutters, distribute a mailing to abutters which briefly describes the project and provides notification of the date, time, and location of a public meeting, present the preliminary design plans and results of the hydraulic modeling at a public meeting in Conway, draft a letter supporting the project and distribute to abutters for their signatures, contact the Conway School Board and provide the Board with a set of the preliminary design plans, present the preliminary design plans at a School Board meeting, and draft a letter in support of the project and provide the letter to the School Board for signature.

Task 5A: Prepare abutter list and notification. Deliverable: Abutter list and copies of letters distributed to abutters describing the project and providing notice of the public meeting.

Task 5B: Complete presentation at public meeting. Deliverable: Meeting attendance sheet and minutes.

Task 5C: Draft Letters of support. Deliverable: Copies of letters of support distributed to abutters.

Task 5D: Solicit school district coordination. Deliverable: Copy of letter of support provided to the school board.

Performance Target 6: Final Design Plans and Cost Estimate
Prepare final design plans and a cost estimate for project implementation.

Task 6A: Prepare final design plans. Deliverable: Set of final design plans.

Task 6B: Prepare cost Estimate. Deliverable: Copy of cost estimate.

Performance Target 7: Quality Assurance Project Plan (QAPP)
Prepare an *Abbreviated Quality Assurance Project Plan for Non-Monitoring Projects Involving Pollutant Load Reduction Modeling or Engineering Calculations* per NHDES guidelines, submit to NHDES for review, and revise as necessary.

Task 7: Prepare and submit the Quality Assurance Project Plan (QAPP) covering the pollutant load reduction activities. Deliverable: Copy of NHDES-approved QAPP.

Performance Target 8: Sediment Pollutant Load Reduction Estimates
Estimate anticipated sediment load reductions resulting from the project per the methods described in the NHDES-approved QAPP.

Task 8: Estimate sediment pollutant load reduction. Deliverable: Copy of the load reduction estimates.

Performance Target 9: Environmental Permit Applications
Prepare and submit NHDES Wetlands Bureau Dredge and Fill Permit application, NHDES Site Specific Permit application, NHDES Water Quality Certification application, Army Corps Individual Permit application, and FEMA Conditional Letter of Map Revision (CLOMR) application and prepare a Stormwater Pollution Prevention Plan (SWPPP) for

use by the future construction contractor in obtaining an EPA Construction General Permit.

Task 9A: Prepare and submit the NHDES Wetlands Bureau dredge and fill permit application. Deliverable: Copy of permit application.

Task 9B: Prepare and submit the NHDES Site Specific permit application. Deliverable: Copy of permit application.

Task 9C: Prepare and submit the NHDES Water Quality Certificate Application. Deliverable: Copy of permit application

Task 9D: Prepare and Submit the Army Corps of Engineers Individual Permit application. Deliverable: Copy of permit application.

Task 9E: Prepare and submit the FEMA Conditional Letter of Map Revision (CLOMR) application. Deliverable: Copy of permit application.

Task 9F: Prepare and submit the EPA Stormwater Pollution Prevention Plan (SWPPP). Deliverable: Copy of SWPPP.

Performance Target 10: Final Report
Prepare a comprehensive final report in both electronic and hard-copy formats and submit to NHDES on or before the project completion date. The final report shall include a description of all tasks completed and shall comply with the NHDES and EPA requirements found in the final report guidance document on the NHDES Watershed Assistance Section webpage.

Task 10: Prepare and submit the project final report. Deliverable: Copy of final report in hard copy and electronic formats.

Project Performance Target Verification

Performance Target 1: Geotechnical Investigations
Ward Geotechnical Consulting, PLLC (WGC) was subcontracted to perform the necessary geotechnical analyses. Four borings were completed in the vicinity of the proposed arch culvert locations between May 8 and May 10, 2007. The borings were used to determine subsurface conditions for use in the design of footings for the arch culverts. In general, the borings revealed that subsurface soil conditions are suitable for construction of concrete spread footings. WGC prepared a geotechnical report which included soil boring logs, lab analysis results, and a narrative description of their findings and recommendations. This report was dated January 19, 2008 and copies were provided to NHDES, SRLAC, and the Conway Scenic Railroad. A copy of the Geotechnical Report is attached in Appendix 2.

Performance Target 2: Field Surveys, Wetland Delineation, and Additional Data Collection
Headwaters Hydrology, PLLC (HH) collaborated with Kellogg Surveying and Mapping, Inc. to perform a topographical survey of the project area in September and October 2007. At this time the limits of state and federally-regulated waters were delineated and five cross-sections originally surveyed in September 2003 were re-surveyed (note that the cross-sections were monumented in 2003 to make their retrieval and re-survey

possible). The surveys were performed relative to NH State Plane grid and the National Geodetic Vertical Datum of 1929 (NGVD29). The topographic and wetland mapping were used to generate the project site plans (see plan set in Appendix 1). The cross-sections were used in the hydraulic models, in the sediment pollutant load reduction estimate, and to evaluate changes in channel dimension since originally surveyed. Plots of the cross-sections were submitted to NHDES, SRLAC, and the Conway Scenic Railroad in January 2008 and also again in February 2009 along with the sediment pollutant load reduction estimate. Plots of the cross-sections showing both the 2003 and 2007 surveys are attached in Appendix 2 along with a plan showing the cross-section locations.

A bedload sediment sample was collected from a depositional bar within the project area by HH in January 2008. This sample was sieved and weighed and a particle size distribution analysis of the sample was performed, the results of which were used in sediment transport calculations utilized in the project design. The bedload sampling data, particle size distribution plot, and sediment transport (entrainment) calculations were submitted to NHDES, SRLAC, and the Conway Scenic Railroad in January 2008. Copies are included in Appendix 2.

Performance Target 3: Hydraulic Modeling

Data from the 1978 FEMA Flood Insurance Study (FIS) was acquired and used in combination with the cross-section surveys to create an existing conditions hydraulic model of approximately 5,100 feet of the river with the U.S. Army Corps of Engineers HEC-RAS computer program. The existing conditions model was modified to create several potential proposed conditions models, or scenarios, which included various sizes and configurations of floodplain culverts as well as modifications to the river channel. Each scenario was evaluated to determine its effect on hydraulic conditions, particularly flood stages, flow velocity, and channel shear stress as these variables are indicative of the river's sediment transport competence. The scenario with the smallest combination of floodplain culverts which: (1) reduced backwater above the bridge, (2) created a smooth water surface profile through the crossing, (3) did not increase flood stages at any location, (4) increased channel flow velocity and shear stress immediately above the bridge, and (5) decreased channel flow velocity and shear stress immediately below the bridge was selected as the preferred scenario for final design. That combination included an embedded 60-foot span pre-cast concrete arch on the south side of the river and an embedded 42-foot span pre-cast concrete arch on the north side of the river. Results of the hydraulic modeling were submitted to NHDES, SRLAC, and the Conway Scenic Railroad in January 2008. Due to minor design changes made to the preliminary design, the hydraulic model completed under this task was revised under performance target 9 (CLOMR Application). An exhibit comparing the existing and proposed conditions 100-year flood profiles is attached in Appendix 3.

Performance Target 4: Preliminary Design Plans

Based on the hydraulic modeling, sediment transport calculations, cross-section surveys, and other geomorphic data and analysis published in the 2004 assessment report, preliminary engineering design plans were prepared. These included a preliminary site plan and cross-section drawings depicting the floodplain culverts and proposed modifications to the river channel. The preliminary design plans were submitted to NHDES, SRLAC, and the Conway Scenic Railroad in January 2008. Copies of the preliminary site plan and railroad crossing cross-section are attached in Appendix 2.

Performance Target 5: Abutter Notification and Support

The proposed project would be constructed on property owned by four different landowners – the Conway Scenic Railroad, the Conway School District, the Kennett Company, and Mr. Todd Marshall. The project cannot be constructed without their approvals. In addition, twenty-five other properties abut the parcels upon which the project would be constructed. It was also necessary to inform these abutters of the proposed project. The following steps were taken to inform and obtain the support of those landowners upon whose property the project would be constructed and the abutters.

- Copies of the municipal tax maps covering the project area were obtained. These were scanned and digitally spliced to create a composite tax map showing the properties upon which the project would be constructed (i.e. affected properties) as well as the abutting properties. A copy of this map is attached in Appendix 4.

- A list was compiled of the affected and abutting properties. Records from the Town of Conway Assessor's office were used to determine the owner of each property and their mailing address. A copy of the abutter list is attached in Appendix 4.

- A public meeting to present the preliminary project plans was scheduled for 5:30 pm on January 29, 2008 at the U.S. Forest Service Saco Ranger Station in Conway. Meeting notifications were sent via postal mail to each abutter. Notifications were also sent to each of the affected property owners along with a cover letter describing the project and a copy of the preliminary site plan. The meeting was also advertised in two local newspapers (The Conway Daily Sun and The Mountain Ear) and on local radio (Mt. Washington Radio). Copies of the meeting notification and cover letter are attached in Appendix 4 along with the newspaper and radio information.

- A PowerPoint presentation was prepared and delivered at the public meeting. A total of seventeen abutters and stakeholders attended the meeting, including representatives of all four of the affected properties. An open question and answer session followed the presentation. Several of the abutters expressed concerns that the project would worsen flooding conditions on their properties. A boilerplate letter of support was distributed at the meeting for those in support of the project to sign; however, none of the attendees signed and returned the letter. Copies of the meeting attendance sign-in sheet, letter of support, and meeting summary are attached in Appendix 4.

- The proposed project was presented to the Conway School Board at their February 25, 2008 Meeting at Kennett High School in Conway. A narrative description of the project and preliminary plans were provided to the school board prior to the meeting and large format paper plans were presented at the meeting. The board members expressed concerns over increased flooding and sediment deposition, liability in the event of flood damage, and changes to the FEMA Special Flood Hazard Area (SFHA) designation of their property which would further restrict allowable land uses. A letter of support was provided to the school board for their signature; however, the board declined to sign. Copies of the information sent to the board prior to the meeting, a narrative summary of the meeting, and the letter of support are attached in Appendix 4.

The project was also presented at a second school board meeting on July 14, 2008. The primary intent of this second meeting was to obtain the board's permission to screen the project site for state and federal threatened and endangered species and exemplary natural communities as this screening was required for the FEMA CLOMR application, EPA SWPPP, and NHDES Wetland Permit application. As a result of this meeting, the school board gave their permission for the screening.

Performance Target 6: Final Design Plans and Cost Estimate

The preliminary plans, hydraulic modeling, results of the geotechnical investigation, and additional calculations and analyses were used to complete the final project design and draft a fifteen-sheet set of detailed project plans. The final plans were submitted to NHDES, SRLAC, and the Conway Scenic Railroad in February 2009. A reduced copy of the plan set is attached in Appendix 1. The plan set includes grading site plans, cross-sections of the river channel, a river profile, a revegetation plan, layout, grading, and cross-sections of the floodplain culverts, culvert foundation plans, and construction details and notes. Structural engineering components of the final design were completed by Stewart Structural Engineering, PLLC.

The final plans were used to estimate construction quantities and costs as shown on the cost estimate in Appendix 1. The NH Department of Transportation's weighted average unit price list was used to estimate the unit price of many of the construction items. The estimated project cost is $2.93 million. The cost estimate was submitted to NHDES, SRLAC, and the Conway Scenic Railroad in February 2009.

Performance Target 7: Quality Assurance Project Plan (QAPP)

An abbreviated QAPP outlining the procedures and quality assurance measures for estimating the sediment pollutant load reduction resulting from the project was prepared per NHDES guidelines and submitted in electronic format to NHDES for review in April 2008. NHDES and EPA comments were received in May 2008 and a final draft was submitted to NHDES in electronic format in June 2008. Paper copies of the QAPP were submitted to NHDES, SRLAC, and the Conway Scenic Railroad in February 2009. A copy of the QAPP is attached in Appendix 5.

Performance Target 8: Sediment Pollutant Load Reduction Estimates

The sediment pollutant load reduction resulting from the project was estimated using the techniques described in the QAPP. It is estimated that the project will reduce sediment loading to this reach of the Swift River by 265 cubic yards, or 450 tons, per year. The sediment pollutant load reduction estimate was submitted to NHDES, SRLAC, and the Conway Scenic Railroad in February 2009. The pollutant load reduction calculations are attached in Appendix 5.

Performance Target 9: Environmental Permit Applications

The grant agreement included five environmental permit applications and preparation of a Stormwater Pollution Prevention Plan (SWPPP) in support of a future EPA Construction General Permit (CGP); however, during the course of the project it was determined that three of the environmental permits would likely not be required – NHDES Site Specific Permit (a.k.a. Alteration of Terrain Permit), Army Corps of Engineers Individual Permit, and NHDES Water Quality Certificate. In preparing the scope of services for the grant agreement, NHDES and SRLAC anticipated that these permits would likely not be required as evidenced by the minimal costs assigned to

preparing the applications for these permits – $100 each. They were included in the scope of services in the unlikely event they were required.

The following environmental permit applications and documents were prepared.

- *FEMA Conditional Letter of Map Revision (CLOMR) Application*
  The HEC-RAS hydraulic model prepared under performance target 3 was revised to reflect minor changes between the preliminary and final design plans. FEMA's CHECK-RAS program was used to verify that hydraulic estimates and assumptions used in the model were justified and in accordance with the assumptions and limitations of the HEC-RAS program and applicable FEMA requirements. The hydraulic model, supporting documentation, and required forms were submitted to the FEMA National Service Provider in Alexandria, Virginia as a complete CLOMR application package in April 2009. FEMA responded to the application in May 2009 with a comment letter requesting additional information and clarification of some of the materials submitted. Additional information was submitted in response to the comment letter and FEMA subsequently issued the CLOMR on June 24, 2009.

  In the CLOMR, FEMA states that they concur with the hydraulic modeling results which indicate that the proposed project will reduce flood stages in the project area. A copy of the CLOMR application package was submitted in paper and electronic formats to NHDES, SRLAC, and the Conway Scenic Railroad in April 2009. The application package is too large to include a copy with this report; however, a copy of the CLOMR is attached in Appendix 3 along with a profile of the peak 100-year discharge showing existing and proposed flood stages.

- *NHDES Wetlands Bureau Standard Dredge and Fill Permit Application*
  An application for a Standard Wetland Dredge and Fill Permit was prepared and submitted to the NHDES Wetlands Bureau in October 2009. Because this is a restoration project funded by a state grant, it is considered a "minimum impact" project under the Wetlands Bureau administrative rules. A copy of the wetland permit application package was submitted in paper format to NHDES (Watershed Assistance Section), SRLAC, and the Conway Scenic Railroad in October 2009. The wetland permit application package is too large to include a copy with this report; however, a copy of the "Notice of Administrative Completeness" letter from the Wetlands Bureau, dated October 29, 2009, is attached in Appendix 3. The Wetlands Bureau is required to review and respond to the application within 105 days, or by February 11, 2010.

  A key component of the wetland permitting process is obtaining the affected property owners' permission for the Wetlands Bureau to issue the permit. For this reason, the CLOMR was obtained prior to submitting the wetland permit application as it was thought that obtaining FEMA's concurrence with the findings that the project will not increase flood levels would allay some of the affected property owners' concerns and increase the likelihood of obtaining their permissions. However, as of the date of this report, only one of the four affected property owners, Kennett Company, has provided their written permission. A copy of the letter sent to the Conway School District requesting their permission is attached in Appendix 3. Similar letters were sent to all of the affected property owners (i.e. Conway Scenic Railroad, Conway School District, Kennett Company, and Todd Marshall).

In accordance with state regulations, a copy of the wetland application was submitted to the NH Division of Historical Resources (NHDHR) for review of potential impacts to cultural resources. In response, NHDHR requested an archaeological survey of the project area; however, the grant does not include funding for an archaeological survey. A copy of the response letter from NHDHR is attached in Appendix 3. In the event that the required landowner permissions are obtained, an archaeological survey will be needed.

- *EPA Stormwater Pollution Prevention Plan (SWPPP)*
  In accordance with the requirements of the USEPA Construction General Permit, a Stormwater Pollution Prevention Plan (SWPPP) was prepared for the project. The SWPPP describes methods to be utilized during construction to minimize adverse impacts to water quality. A copy of the SWPPP was submitted in paper format to NHDES, SRLAC, and the Conway Scenic Railroad in July 2009.

The following permit applications will not likely be needed for the project.

- *NHDES Site Specific Permit Application*
  This permit, also known as an Alteration of Terrain (AOT) permit, is generally required for projects which disturb greater than 100,000 square feet of land or greater than 50,000 square feet of land if any of the disturbance area lies within the state's protected shoreland. The project disturbance area would exceed these thresholds; however, a permit is not needed per Section Env-Wq 1503.03(e) of the current NHDES Alteration of Terrain administrative rules which exempts a project if "*the work that requires a permit…also needs to be permitted under RSA 482-A and will not disturb any land having a grade of 25% or greater within 50 feet of any surface water, and review of the AOT permit application would simply duplicate the review that will occur under the RSA 482-A permit application*." The "RSA 482-A permit application" is the wetland dredge and fill permit application previously submitted.

- *Army Corps of Engineers Individual Permit Application*
  Individual permits under Section 404 of the Clean Water Act have typically not been required for stream restoration projects in New Hampshire. Per personal communications with NHDES Rivers Coordinator Steven Couture on December 4, 2008, it is unlikely that the Corps or other federal agencies will require an Individual Permit (IP) for this project. In lieu of an IP, the Corps is expected to authorize the project under the NH Programmatic General Permit (PGP) per their discretionary authority authorized under General Permit Condition 4 of the PGP. A final determination as to the need for an IP cannot be made after the NHDES Wetlands Bureau issues the state wetland permit; however, before the Corps can authorize the project under the PGP, the archaeological survey must be completed and any concerns expressed by the NHDHR must be addressed.

- *NHDES Water Quality Certificate Application*
  Water quality certification under Section 401 of the Clean Water Act is required only if an IP is required. As an IP will not likely be required, a water quality certificate is also not expected to be needed.

<u>Performance Target 10: Final Report</u>
This report meets this performance target.

Project Outcomes and Measureable Results

The outcomes and results of this phase of the project are evaluated in terms of successful completion of final project design, environmental permit applications, and the other performance targets. As described in the previous section, the performance targets described in the grant agreement have been successfully completed.

On a technical note, one of the more interesting outcomes is that the results of the standard engineering analyses (i.e. hydraulic modeling) generally support the conclusions of the fluvial geomorphic assessment completed under the initial phase of this project. The existing conditions hydraulic modeling identified backwater and a reduction in channel energy just above the bridge. These conditions are typically indicative of a depositional environment and support the geomorphic assessment results which identified aggradation as the dominant process causing the channel instability. Furthermore, the hydraulic modeling for proposed conditions supports the general recommendations presented in the earlier assessment report which included adding large floodplain culverts and narrowing the channel immediately upstream from the crossing. The proposed conditions hydraulic modeling indicates that adding the culverts and making these channel modifications will alter hydraulic conditions in a manner which increases sediment transport competence and therefore addresses the root cause of channel instability.

Measureable results stemming from the ultimate project goal of restoring channel stability would include decreased erosion and sediment loading and improved aquatic and riparian habitats. Actually reaching this goal and achieving these results is, to a large degree, dependent upon the actions and decisions of other stakeholders. Project implementation cannot occur without permission from all affected property owners and substantial funding.

Conclusions and Recommendations

The geomorphic and engineering assessments completed to date indicate the root cause of channel instability is the constriction created by the railroad crossing. Improving environmental conditions will require stabilizing the river channel, which requires alleviating the constriction. The most cost effective method to reduce the constriction is to add additional floodwater conveyance capacity using large culverts. Final design plans, environmental permit applications, and estimates of construction costs and the anticipated sediment load reduction were completed under this phase of the project.

Implementation of the project is likely to hinge upon two main factors – permission from the affected landowners and funding. Of these, landowner permissions should be addressed first as they are needed to obtain the requisite environmental permits and having the permits in-hand will improve the likelihood of receiving funding. The affected landowners must be engaged in a dialogue aimed at securing their approvals.

One lesson learned is that, due to landownership issues and high construction costs, once constructed, deficient stream crossings are difficult to correct. This provides evidence in support of recent regulatory emphasis placed on ensuring new and replacement stream crossings do not create similar situations.

APPENDICES

Appendix 1 – Final Design Plans and Construction Cost Estimate

- Final design plan set (reduced copy)
- Construction cost estimate

Appendix 2 – Data Collection and Preliminary Design Drawings

- Geotechnical report
- Cross-section location plan and plots
- Bedload sampling data, particle size distribution plot, and entrainment calculation
- Preliminary design drawings (reduced copies)

Appendix 3 – Environmental Permitting Information

- Conditional Letter of Map Revision (CLOMR)
- 100-year flood profile
- NHDES Wetlands Bureau Notice of Administrative Completeness
- Conway School District permission request letter
- NH Division of Historic Resources (NHDHR) response letter

Appendix 4 – Public and School Board Meeting Information

- Composite tax map
- Abutter list
- Public meeting notification, cover letter, and newspaper and radio information
- Public meeting attendance sign-in sheet and sample letter of support
- Public meeting summary
- Information provided prior to School Board prior to meeting
- School Board meeting summary and sample letter of support

Appendix 5 – QAPP and Sediment Pollutant Load Reduction Estimate

- QAPP
- Estimated sediment pollutant load reduction calculations